MONITORING PLAN

PROJECT NO. PO-22 BAYOU CHEVEE SHORELINE PROTECTION

DATE: May 6, 1998

Project Description

The Bayou Chevee Shoreline Protection project is located within the northern section of the Bayou Sauvage National Wildlife Refuge, approximately 10 mi (16 km) northeast of New Orleans, Louisiana (figure 1). The project area is located on the southern shoreline of Lake Pontchartrain and is divided into two areas, the north cove area and the south cove area. The north cove project area, comprising 164 ac (63 ha), is located just north and west of Bayou Chevee. It extends 300 ft (91 m) into the marsh from the existing shoreline of an 110 ac (45 ha) pond for a total of 57 ac (23 ha) of brackish marsh. The south cove area, consisting of 48 ac (19 ha), is located southeast of Bayou Chevee and northwest of Chef Menteur Pass. It extends 300 ft (91 m) into the marsh from the existing shoreline around a 27 ac (11 ha) cove for a total of 21 ac (8.5 ha) of brackish marsh. Project and reference area marshes are dominated by *Spartina patens* (marshhay cordgrass) with *Pluchea spp.* and *Cyperus spp.* present.

Interior project and reference boundaries were defined as the line that the marsh would be expected to erode to in twenty years, given constant erosion rates, without project implementation. High wave energies associated with Lake Pontchartrain and Chef Menteur Pass have caused extensive shoreline erosion along the Lake Pontchartrain shoreline that has been estimated to average 15 ft/yr, or approximately 3.55 ac/yr (1.44 ha/yr) from 1958-1983 (U.S. Army Corps of Engineers [USACE] 1997). Over the twenty year life of the project, the shoreline would be expected to erode 300 ft (91 m), without project implementation, thus defining project and reference interior marsh boundaries.

Shoreline erosion was not a measurable problem for the interior pond of the north cove prior to 1997 when the pond was separated from Lake Pontchartrain by a 250 ft (76 m) strip of marsh. However, by early 1997, this marsh had disappeared leaving the interior shoreline exposed to the wind and wave energies of Lake Pontchartrain. Moreover, it is anticipated that the interior shoreline will erode at the approximately 15 ft/yr (4.6 m/yr) that is occurring at the adjacent shoreline. Additionally, observations from 1985 have noted further marsh loss in the area from vertebrate herbivory and possible hurricane damage (Gagliano et al. 1988).

The New Orleans District (NOD) of the USACE proposes to provide shoreline protection across both the north and south cove areas thereby protecting the 57 and 21 ac (23 and 8.5 ha) of brackish marsh in those respective areas. This protection will be achieved by building a 2,870 ft (875 m) rock dike across the mouth of the north cove area that will be tied into the existing shoreline to the north and south. In addition, a 2,820 ft (860 m) rock dike will be tied into an existing U.S. Fish and Wildlife Service (USFWS) rock dike and will extend across the south cove area to a point just west of Chef Menteur Pass (figure 2). Both rock dikes will be constructed of 200-400 lb (91 - 182 kg) rock, and will be placed to an elevation of +3.5 ft (1.07 m) NGVD. Two fish dips will be
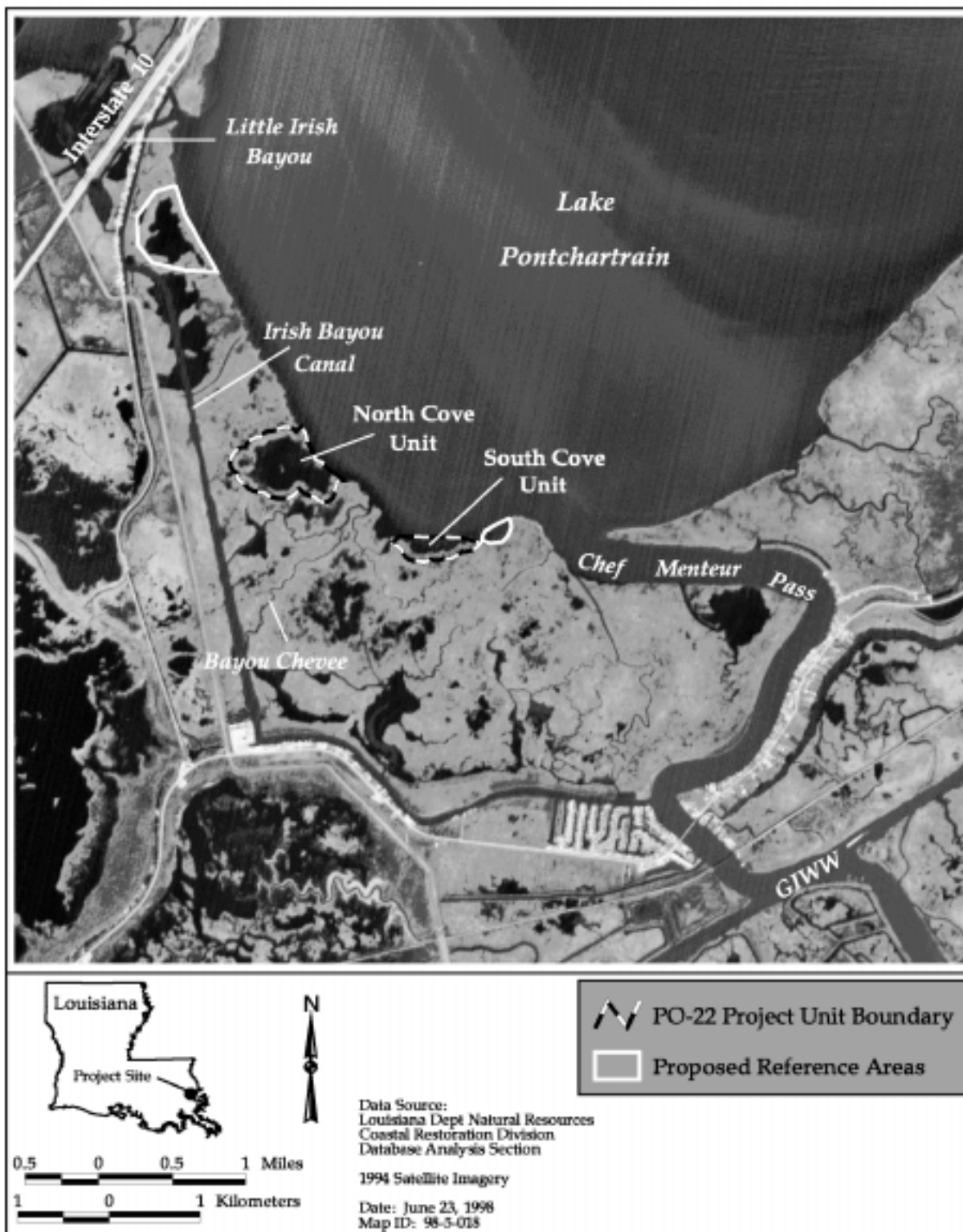
**Figure 1**.  Bayou Chevee Shoreline Protection (PO-22) project and reference area boundaries.
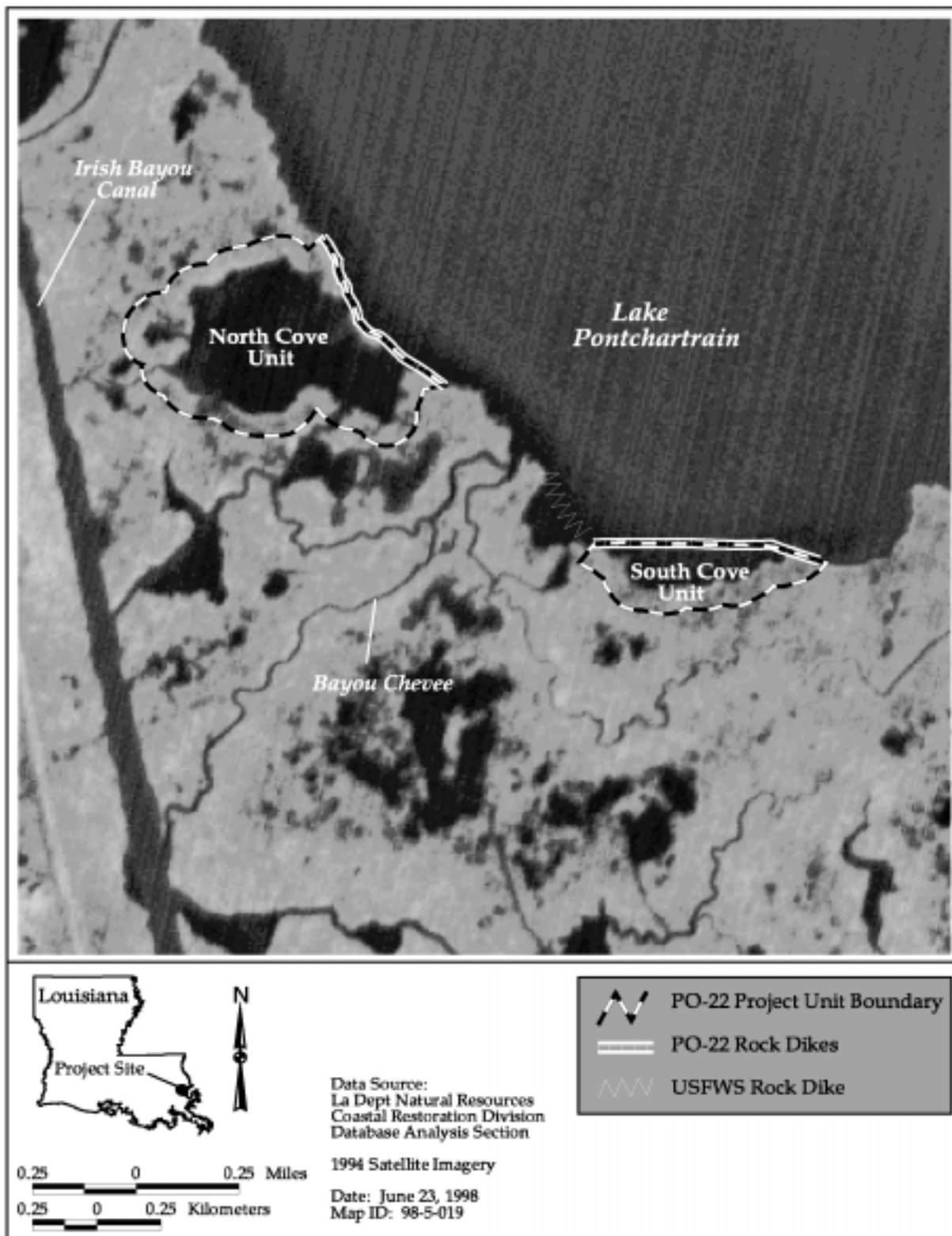
**Figure 2**. Bayou Chevee Shoreline Protection (PO-22) project features.

constructed along both the north and south cove dikes to allow aquatic organisms access to the shallow-water coves. The shore protection will allow for the enclosed shallow water areas to be colonized by a greater abundance of submerged aquatic vegetation (SAV), as has been observed behind the existing USFWS rock dike in the south cove area. Preliminary field investigations revealed the presence of *Myriophyllum spicatum* (Eurasian water-milfoil) and *Ceratophyllum demersum* (coontail) in the north reference area; *M. spicatum*, *C. demersum*, and *Valisneria americana* (wild celery) in the north project area; and only *V. americana* in the south project and reference areas.

### Project Objectives

Provide shore protection for the north cove and south cove areas of the Bayou Sauvage National Wildlife Refuge and enhance the establishment of submerged aquatic vegetation in the south cove area while maintaining or enhancing their establishment in the north cove area.

### Specific Goals

The following goals will contribute to the evaluation of the above objective:

1.  Decrease the mean rate of shoreline erosion in both the north and south cove areas through the use of a rock dike.

2.  Maintain (north cove) or maintain/increase (south cove) mean abundance of submerged aquatic vegetation in the ponds behind the rock dikes.

### Reference Area

The importance of using appropriate reference areas cannot be overemphasized. Monitoring on both project and reference areas provides a means to achieve statistically valid comparisons, and is, therefore, the most effective means of evaluating project effectiveness. An area located northwest of the north cove unit of the project area in the vicinity of Irish Bayou and the Irish Bayou canal was selected to serve as a reference area for the north cove area for all monitoring elements (figure 1). The small cove located immediately east of the south cove area was selected to serve as a reference area for the south cove area for all monitoring elements (figure 1). The evaluation of sites was based on the criteria that both the north and south cove project and reference areas have similar emergent and submergent vegetation communities, soil types, and hydrologic conditions. Both areas of the project and reference areas are classified as brackish marsh (Gagliano et al. 1988) and contain very poorly drained, organic Clovelly and Lafitte soils (Soil Conservation Service [SCS] 1989). Submergent vegetation is also similar between each project and its respective reference area. Prevailing winds are from the south to southeast from January to July and from the northeast to east northeast September to December (USFWS 1994). The average rate of shoreline erosion for project and reference areas is 15 ft/yr (4.6 m/yr) (USACE 1997).

Monitoring Elements

The following monitoring elements will provide the information necessary to evaluate the specific goals listed above:

1.   Shoreline Survey    To document shoreline movement, the vegetated shoreline of the project and reference areas will be surveyed using a differential GPS unit. The shoreline will be sampled every 50 ft (15.2 m), or at noticeable points of inflection, to establish a fine-scale continuum defining the position of the shore. The northern project area shoreline is 10,080 ft (3,072 m) long. This distance will yield over 200 points with which to plot the shoreline. The southern project area shoreline is 3,000 ft (914 m) long. This distance will yield approximately 60 points. Reference area shoreline lengths are unknown at this time, however, they will be sampled in the same manner as the project area. Project and reference areas will be sampled once following completion of construction in 1999 and in 2002, 2005, 2008, 2011, 2014 and 2017 post-construction. The survey will be used to document shoreline change over time.

2.   Vegetation         The frequency of occurrence of submerged aquatic vegetation (SAV) will be documented during the spring of 1998 (pre-construction) and in 2002, 2005, 2008, 2011, 2014 and 2017 post-construction. Methods described in Nyman and Chabreck (1996) will be used to determine the frequency of occurrence of SAV. Two transects will be established in each project and reference area with start and end points set up via differential GPS. These transects will cross each cove on the long axis and will be parallel to each other. Transects will be placed so that they are separated by approximately one third the cove width. Frequency of occurrence will be determined through randomly placed sampling stations located along each transect. There is no upper limit to the number of stations to be sampled but transects located in the smaller southern project and reference areas will contain at least 25 points while the larger northern project and reference area transects will contain at least 50 sampling stations.

Anticipated Statistical Tests and Hypotheses

The following hypotheses correspond with the monitoring elements and will be used to evaluate the accomplishment of the project goals.

1.   Descriptive and summary statistics, analysis of variance (ANOVA), and suitable hypothesis testing will be used to compare measured rates (ft/yr) of shoreline movement in both the

north and south cove areas of the project area and in the reference areas. Historical rates of shoreline erosion are available (Gagliano et al. 1988) and will be used to describe preconstruction conditions.

*Goal:* Decrease the mean rate of shoreline erosion in both the north and south cove areas through the use of a rock dike.

*Hypothesis*:

$H_0$: Shoreline erosion rate in project area at time point i will be significantly greater than or equal to shoreline erosion rate in the reference area at time point i.

$H_a$: Shoreline erosion rate in project area at time point i will not be significantly greater than or equal to shoreline erosion rate in the reference area at time point i.

2. Submerged aquatic vegetation (SAV) data will be evaluated through ANOVA. This test will allow for the analysis and documentation of vegetation changes within the project area over time.

*Goal:* North cove: maintain or increase mean abundance of submerged aquatic vegetation in the ponds behind the rock dikes.

*Hypothesis*:

$H_0$: Mean submerged aquatic vegetation abundance in the north cove project area at time point *i* will be significantly less than or equal to mean submerged aquatic vegetation abundance in the north cove reference area at time point *i*.

$H_a$: Mean submerged aquatic vegetation abundance in north cove project area at time point *i* will not be significantly less than or equal to submerged aquatic vegetation abundance in north cove reference area at time point *i*.

If the null hypothesis is not rejected, possible negative effects will be examined.

*Goal:* South cove: increase mean abundance of submerged aquatic vegetation in the ponds behind the rock dikes.

*Hypothesis*:

$H_0$:   Mean submerged aquatic vegetation abundance in the south cove project area at time point $i$ will be significantly less than or equal to mean submerged aquatic vegetation abundance in the south cove reference area at time point $i$.

$H_a$:   Mean submerged aquatic vegetation abundance in south cove project area at time point $i$ will not be significantly less than or equal to submerged aquatic vegetation abundance in south cove reference area at time point $i$.

If the null hypothesis is not rejected, possible negative effects will be examined.

NOTE:   Available ecological data, including both descriptive and quantitative data, will be evaluated in concert with the statistical analysis of all of the above data to aid in determination of the overall project effectiveness.  This includes ancillary data collected in the monitoring project but not used directly in statistical analysis, as well as data available from other sources (USACE, USFWS, USGS, LSU, DNR, etc.).

Notes

1.   Planned Implementation:          Start construction      2/13/99
                                       End construction        9/13/99

2.   USACE Point of Contact:          Sue Hawes               (504) 862-2518

3.   DNR Project Manager:             David Burkholder        (504) 342-6814
     DNR Monitoring Manager:          Michael Sealy           (504) 342-6750
     DNR DAS Assistant:               Brian Zielinski         (504) 342-4123

4.   The twenty year monitoring plan development and implementation budget for this project is $146,628.  A progress report will be available in January 2000, and comprehensive reports will be available in January 2003, January 2006, January 2009, January 2012, January 2015, and January 2019.  These reports will describe the status and effectiveness of the project.

5.   References:

Gagliano, S.M, D.W. Roberts, and R.J. Sauvage, Jr. 1988.  Evaluation of the Wetlands of Eastern Orleans Parish, Louisiana.  Baton Rouge, Louisiana: Coastal Environments, Inc.  53 pp.

Nyman, J. A, and R. H. Chabreck. 1996.  Some Effects of 30 Years of Weir Management on Coastal Marsh Aquatic Vegetation - Implications to Waterfowl Management. Gulf of Mexico Science 1: 16-25.

Steyer, G. D., R. C. Raynie, D. L. Steller, D. Fuller and E. Swenson 1995.  Quality management plan for Coastal Wetlands Planning, Protection, and Restoration Act monitoring program.  Open-file series no. 95-01.  Baton Rouge:  Louisiana Department    of Natural Resources, Coastal Restoration Division.

U.S. Army Corps of Engineers (USACE) 1997.  Environmental Assessment (EA #261-A) CWPRRA Project XPO-69 Shore Protection at Bayou Chevee, Orleans Parish, Louisiana.  New Orleans: U.S. Army Corps of Engineers.  13 pp.

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U.S. Fish and Wildlife Service 1994.  Final Environmental Impact Statement: Bayou Sauvage National Wildlife Refuge.  Slidell, La. U.S. Fish and Wildlife Service.